# SUPPLEMENT.

# The Mining Journal,

## RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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### A BATTLE WITH THE BASALTS;

BEING AN ATTEMPT TO DELIVER THE CHIEF OR PRIMARY CRYSTALLINE MASSES FROM PLUTONIC DOMINION.


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[*Concluded from the Mining Journal of the 11th of August.*]

Dr. Hutton himself, as before intimated, taught that the metamorphic rocks were originally sedimentary deposits, similar to the secondary, but that they have been altered by the long-continued action of heat. The gneiss and mica-schist systems, reposing on granite, are the formations thus denominated, the former presenting a stratified, and the latter a more or less laminar structure, according to the proportion and distribution in which the mica enters into its composition. And whatever transmutations the mica-schist system may have undergone, it, like the trappean, is somewhat remarkable for the gradations and variety of its mineral contents, being composed for the most part of many contorted alternations of crystalline limestone, quartz rock, hornblende, schist, imperfect clay-slate, and shale, presenting laminæ of mica, chlorite, talc, iron ore, &c. Sir Charles Lyall supposes that the metamorphism of these formations was complete, but Professor Phillips that it was only partial. From all that can be observed of the crystalline structure of the gneiss, composed of the same elements as granite, mica, quartz, and felspar, it would appear to have undergone a transmutation as complete in structural arrangement, &c., as apparently has been effected by the action which converted the sedimentary deposits of the Salisbury precipices into their more compact aggregations, designated trap or greenstone. There can be little or no doubt, however, of the *partial* metamorphism of the mica-schist series, and from the very nature of its constituent materials, as above enumerated, we may readily suppose that the tremendous power of denudation (sweeping away the unchanged or sedimentary portions) has contributed in no inconsiderable degree to that bold and abrupt configuration for which its mountain ranges are so remarkable.

But whatever importance may be attached to speculations of this character, the graduated connection which the chief or primary rocks exhibit with regard to each other in their mineralogical relations, their intersectional joints and vertical cleavage planes (unconnected with true stratification), the mineral salts with which they are charged in aqueous solution, their brecciated, crystalline, metalliferous lodes, clustering symmetrical crystallisations, &c., replete with perfection and beauty, forcibly remind the attentive investigator that the uniform structural arrangement of this great crystalline series of formations, and their attendant phenomena, depend on numerous subtile and highly complex causes, or laws and powers of Nature, in comparison of which inherent heat (though probably an important agent, in a limited sense) has played but a very partial and subordinate part.

I would not, however, have it supposed, from the strictures already adventured against extreme Plutonic views, that I am unmindful of the numerous local evidences existing on various parts of the globe of intense subterranean heat; on the contrary, I am not only fully sensible of such well-attested facts, as represented both by the active and extinct volcanoes, but have visited many of the latter in the south of France (Auvergne), and which, as such, are for the most part characterised by their smooth conical forms and scoriaceous and other volcanic products, which, though untold ages have revolved since they were erupted, preserve all the freshness of recent lavas. The most conspicuous amongst them is the Puy de Dome, which I have distinctly observed from the Place de Parion, at Montpellier, standing out in solitary grandeur on the north-western horizon. The dome is chiefly covered with a whitish trachyte, and rises about 4800 feet above the level of the sea.

Sir H. Davy's hypothesis, that the earths and alkalies which form lavas exist in the centre of the globe in a metallic state, and take fire on the access of water, was soon afterwards abandoned, on the consideration that substances so extremely inflammable and oxidable could not from remote periods have remained in a metallic state; and as yet we have nothing but vague conjecture, unsupported by evidence of any kind, that these isolated, be-scattered centres of incandescent matter derived their sources of heat from central fires. If so, why become *extinct?* Perhaps the production of volcanic eruptions, and their attendant phenomena, may, for the most part, be ascribed to gaseous, chemical, and electro-magnetic agencies, gradually exerting their irresistible and indomitable powers on the various mineral and metallic masses of the earth, and producing, under peculiar and favourable conditions, the most tremendous results. It is worthy of remark, that these foci of intense action are commonly situated near the sea, or often present indubitable evidence of some direct subterranean communication with it, the oxygen of which and the air would cause the combustion of inflammable substances, and the production of sulphurous gases, &c.

As regards the connection of earthquakes with volcanic action, it has been justly observed, that "there can be no difficulty in admitting that, if a current of subterranean water were to find access to a mass of lava many miles in extent, and most intensely heated, it would produce (by explosions of hydrogen gas, &c.) an earthquake more or less violent in proportion to the quantity of steam generated and its distance from the surface." The same eminent geological authority has also remarked, so long back as some twenty years ago, that "now the identity of magnetic and electric agency seem in many respect to be established, it may deserve consideration, whether an interruption to the magnetic or electric currents which circulate through the earth may not sometimes occasion earthquakes, acting almost instantaneously over large portions of the globe. We can scarcely doubt," says he, "that chemical changes are taking place which will also change the electrical relations between mineral beds. A series of strata may act like the plates of an immense voltaic battery, and discharge the electricity from one internal part of the globe to another, exciting vibrations that may agitate a whole hemisphere. Voltaic energy is capable of producing the most intense degree of heat without access to atmospheric air, or even in vacuo, and this for an indefinite time." In a review of *Cosmos* the remark occurs, that, "as magnetic currents are produced by changes of temperature, our earth—scorched at its equator and frozen at its poles of maximum cold—has been regarded as a great thermometric apparatus, and all the phenomena of terrestrial magnetism, luminous as well as mechanical, as the consequence of this condition." When it is considered that magnetism, apparently so feeble is in reality fraught with the most tremendous dynamic effects, we doubtless have in the above-cited agencies alone sources of heat and power abundantly adequate to the production of most of the great series of changes and disturbances to which the shell of the earth has so obviously been subjected. But the existence of another insensible, though all-powerful, upheaving auxiliary has recently been exemplified by Colonel Patten's experiments, made in America, to ascertain the ratio according to which some of the stones commonly used in architecture expand with given increments of heat. It is explained that, according to the laws of expansion thus ascertained, a mass of sandstone, a mile in thickness, which should have its temperature raised 200° Fahr., would lift a superimposed layer of rock to the height of 10 feet above its former level. But, supposing a part of the earth's crust, 100 miles in thickness, and equally expansible, to have its temperature raised 600° or 800°, this might produce an elevation of between 2000 and 3000 feet. The cooling of the same mass might afterwards cause the overlying rocks to sink down again, and resume their original position. By such agency might be explained the gradual rise of Scandinavia or the subsidence of Greenland. As to the displacement, dislocation, and tilting, of larger or smaller masses and areas of rock and strata, so commonly observable in all formations, they are usually owing to a variety of local mechanical disturbances, too evident to need description here.

Internal or subterranean heat, not unfrequently manifests itself in instances of what have been termed pseudo-volcanoes, arising from the combustion of inflammable substances—as carbon, sulphur, and hydrogen, the chemical combination of iron, sulphur, and water; or, as illustrated in the familiar examples of the cliffs of Whitby, in Yorkshire, and Charmouth and Weymouth, in Dorsetshire, where the bituminous and pyritous shales have ignited by spontaneous combustion, arising from decomposition and exposure to the atmosphere. Von Dechen's thermometrical experiments have elicited some curious facts in respect to the variable distribution of heat in the earth's crust; he thus ascertained, in the Prussian mines, that in general the increase of temperature is much more rapid in coal than in metalliferous deposits. Practical miners are familiar with the fact, that at equal depths granite rocks are always colder than the slates; and it is a popular opinion among them that lead and stanniferous deposits are of a lower temperature than those in which copper ores occur; and, also, that rocks are colder than the metallic veins which traverse them. The wide distribution and varied temperature of thermal springs, found bubbling up from the deep recesses of the earth, under almost every physical aspect and in all climes, also very strikingly attest the extended character and relative intensity of inherent terrene heat. Many of the hottest of these waters rise from the upper secondary strata, as at Bath, where their temperature is 116° Fah., and nearer to which no active volcano exists than in Iceland to the north, and Vesuvius and Etna to the southward. Numerous very similarly situated springs might be cited, with temperatures varying from 100° to 150°, and in rare instances even more. Although it is very probable that certain chemico-combinations, combustion, and other local causes of heat, as already adverted to, may mainly contribute to the high temperature of many of these waters, at comparatively shallow depths, there are, nevertheless, abundant examples to warrant a belief that, for the most part, they derive their heat from the more deeply seated sources. In the deep recesses of the Alps, and especially along the southern base of the central chain, where granites and mica-schists form a junction, numerous hot springs take their rise; and a few years ago, when on a tour in the Pyrenees, I particularly noticed that the thermal waters, at the baths of the Eaux Chaudes, issued from the crevices of grey pyritous granite; which, however, is pretty closely environed by prodigious piles of highly inclined transition rocks.

After what has been stated, it is hardly requisite to remark that the Plutonists are but little warranted in resorting to the very arbitrary hypothesis that the "earth's crust floats on a sea of molten rock;"—from whence its fiery flood was derived, how it is maintained, or how confined, they tell us not. We are acquainted by sensible evidence with about the 400th part of the distance from the surface upon which we dwell, taken at the sea level to the centre, which portion may be called 10 miles; and, considering that the estimated thickness does not exceed 30 miles, in which case the crust may be compared to a thin coating of gilt on an artificial globe, I am quite disposed to agree with Mr. Hopkins in his lucid disquisitions on this subject, that "the consequence of such an igneous nucleus, according to the laws which regulate the circulation of heat through fluid bodies, would be, that the crust of the earth, instead of increasing in thickness, would be altogether melted, even were it 200 miles." But, for my part, if, with the Plutonist, I may be permitted to indulge in a reverie on the physical character of these internal regions of romance (quitting, of course, all ideas of "increased density," but resting on analogies), I would prefer garnishing the stupendous theatre with all the paradisian glories and organisms, animate and inanimate, of the creative energies; and whether lighted up by a central sun, or some all pervading luminous phenomena, it would, to its sentient inhabitants, certainly appear no mean or straightened dwelling-place, for, whilst treading its fairy slopes, the keystone of the majestic arch would be at the incognisable altitude of some 7000 miles overhead, and its natural basements would alike be lost to them in the immensity of intervening space. Even such an internal world—a very paradise for the philosophising materialist—would assuredly be infinitely more in harmony with the Divine attributes, as displayed in the economy of nature, who leaves not a flower or a leaf untenanted, than is the igneous theorist's mighty cauldron filled to overflowing with liquid red-hot matter, ever rousing the dormant energies of fierce, indomitable elements, into a force and fury—

> Which may shatter, ere long, our globular rind,
> And leave not a wreck of the fabric behind!

It has been already intimated that, as a marked and recognised feature of the great crystalline base of the earth's surface, the various formations composing it, pass into each other by insensible gradations. The trapean rocks, also, occasionally graduate into granite, as has been distinctly observed by Von Buch, in a mountain near Christiana, in Norway; greenstone into syenite, from which it differs frequently only in the preponderance of hornblende over felspar; beds of sandstone into quartz rock; gneiss into granite, to which it is so closely allied in its elemental constituents that it may be considered a variety of the latter. By the disappearance of felspar, gneiss passes into mica-schist, by the prevalence of quartz into quartz-rock, of hornblende into hornblende-schist, trap into porphyry, &c. It has also been well ascertained that some of these rocks intrude themselves in the character of dykes, veins, and filaments, into other rocks. Granitic veins are not unfrequently found intersected by veins of granite, or exhibiting similar ramifications on a larger scale, and occasionally forming isolated tabular masses over other formations.

At St. Agnes, in Cornwall, veins of porphyry transverse in irregular directions argillaceous schist. Veins of granite penetrate a mass of granite of another variety, in the vicinity of Carlsbad. Humboldt observed a vein of calcareous spar, 140 ft. wide, traversing gneiss in the Alps of Switzerland. He also found beds of pure quartz in the Andes, between 7000 and 8000 ft. in thickness. Prof. Jameson observed a vein of porphyry slate traversing sandstone in the Isle of Arran nearly 160 ft. wide; and veins of pitchstone and greenstone, from 10 to 100 ft. wide, have been noticed in Scotland. Dr. Hutton discovered in Glen Tilt veins of granite, ramifying into superincumbent rocks of slate and limestone—a spectacle which is said to have thrown him into a state of extacy, as he considered it a practical proof of the fluid nature of granite. I much regret that in traversing Glen Tilt, many years ago, hammer in hand, on my way from the castle town of Braemar to Blair Athol, in the Pass of Killecrankie, I was not fortunate enough to observe these veins, but which, it appears, are chiefly of an attenuated and ramiform character.

Now, from the promiscuous instances above adduced, both as regards the gradating of one rock into another, and veins of primary rocks ramifying through others of a different constituent structure, the Plutonist infers that the whole have been in a melted state, and have derived their distinctive characters and peculiarities, as specified, from the varied conditions of heat and refrigerative influences to which they have been subjected; whereas, I think it can scarcely fail to be perceived, from arguments already adduced, that such observed phenomena, so far from offering any proof in support of the igneous doctrine, are diametrically opposed to it, and very palpably demonstrate the rational solution to be a superinduced chemico-magnetic and crystalline action on the granulated texture of the pre-existing base, the resultant structural re-arrangements being modified by certain local causes, as the presence and degree of moisture or heat, and the excess of one or more elemental substances over others, &c.—processes, in fact, in a degree, assignable to what Humboldt calls elementary *material production*. The circumstance of compact masses of rock being traversed by granitic and other crystalline veins is very commonly beautifully illustrated in the fantastic zig-zag lines of spar, quartz, &c., to be seen in many a hand specimen of marble or other mineral, but whilst we may be well warranted in attributing such adventitious or independent markings to some re-arrangement of granular structure, or the crystalline forces, acting on a humid base, and in particular directions, it would be as absurd to attempt to describe the precise *modus operandi* by which Nature effects those sportive and often beauteous displays, as it would be to presume to explain the means she employs to paint the lily, or to impart lustre to the diamond.

That the metalliferous crystalline lodes of fracture owe their origin to this kind of spontaneous crystalline growth, I entertain not a doubt; it has, in fact, been a settled conviction in my mind, since having witnessed, a few years ago, in the Maratime Alps, some very remarkable and confirmatory instances of brecciated rock occupying large, irregular, isolated areas in homogeneous mountain masses. The angular pieces of rock in these brecciated structures were, as in the above lodes, separated by crystalline ramifications, and it was abundantly apparent that, had they not been divided by the gradual growth of the separating crystalline lines, &c., such dissevered fragments of the parent rock must (if shattered by some convulsive throes of nature as commonly attributable to such phenomena) have at once, by gravitation alone, fallen together again, and henceforth remained like mere heaps of macadamised stones. In the instances we have been considering, of the parent rock thus rifted and traversed either by thin veins of a dissimilar rock, or interlaced by a brecciated crystalline structure, we ought, perhaps, to pursue the original portions of the rock thus invaded to their chemical decompositions, and ascribe the foreign translucent substance occupying its place to the procreative, transmutating, or transposing powers we have repeatedly referred to; as, from examples of small septaria-like structure often to be seen in the centre of vast compact bodies of rock, it is evident that no mere lateral force could have dissevered the angular pieces of rock in question, and, therefore, the crystalline structure now occupying the spaces between them must have gradually converted the parent rock into its own substance; probably by some law or process of molecular aggregation, or the slow action of corpuscular forces.

As presenting some further striking illustrations of the gratuitous character of the doctrine which teaches that crystalline veins, dykes, &c., have forced their way upwards and laterally in streams of melted matter, through formations of all degrees of hardness (for thoroughly consolidated and mineralised the older ones must have been at the period of the irruptions, as in numerous instances the intrusive masses have penetrated even up to the surface of the most recent geological deposits), I may here advert to a notice of Dr. Thomson's, given in the *Annals of Philosophy*, of granite veins in argillaceous schist, at Mouschole, in Cornwall. He says that numbers of them may be traced from the rock of granite into the schist, and that some of these veins may be observed upwards of 50 yards, till they are lost in the sea, and in point of size vary from 1½ ft. to less than 1 inch. One of these veins of granite, after proceeding vertically some distance, suddenly forms an angle, and continues in a direction nearly horizontal for several feet, with schistus both above and below it. "It is truly worthy of notice," says the eminent geologist, Mr. Bakewell, who subsequently visited the spot, "that the veins of granite may be distinctly seen penetrating both the schist and the granite; for the granite in the veins is finer grained than the granite rock, and may as easily be distinguished in the granite as in the schist. The granite rock itself is smaller grained near the line of junction of the two rocks than it is a little distance from it, where it contains larger white crystals of felspar, in a smaller grained reddish granite. What is further remarkable, the largest granite vein in passing into the schist cuts through a vein of quartz thicker than itself; and in a few yards nearer the sea a small quartz vein cuts through the same granite vein." Assuredly, the peculiar character and complexity of the conditions observable in these granite veins is alone sufficiently adverse to the igneous theorist's notion of their injection in a molten state, admitting even the fluid nature of granite, and which must certainly appear more than doubtful when it is reflected that the constituents of primary rocks, &c., melt at unequal degrees of heat, as in the constituents of granite; felspar, mica, and quartz, the first of these ingredients is fused at about half the temperature which the last requires. But there would appear to be little or no difficulty in reconciling these puzzling phenomena to the crystalline forces, laws of affinity, chemical action in aqueous solutions, &c., as above described, and which, in all probability, also afford an easy solution to the formation of dykes or channels of trap and porphyry, not unfrequently found *closed below*, as also to those singularly regular and usually vertical alternations of porphyrytic bands, so commonly characterising the grauwacke slate, and which constitute so important a feature throughout the broad zone of that metalliferous formation traversing the south of Scotland, and thence across the Channel, into the counties of Down, Armagh, Monaghan, and Cavan, in Ireland.

I am happy to have perceived, since the commencement of the present disquisitions, that Mr. E. Hopkins has again called the attention of the Geological Society to the laminated structure of the primary rocks, and whose representations and opinions, as an accurate, scientific, and extensive observer, are certainly entitled to consideration and respect; and for my part, I cordially acquiesce in his suggestion, that the study of the primary rocks merits the special attention of geologists, "as being of extreme interest, and likely to throw great light on several important points in geological science." At the recent sitting, Mr. Hopkins described wide regions in several parts of the world as exhibiting in their geological structure the phenomena of successive vertical bands of schistose and crystalline rocks, parallel with each other, and having a north and south strike. This structural condition was illustrated by several extensive and highly-finished sections, made from his own observations in California, South America, Australia, and Ceylon.

The section across the Andes, for instance, exhibited parallel bands of

porphyry, greenstone, quartzites, mica-schists, granite, gneiss, hornblende-schists, trachyte, crystalline limestone, talcose-schists, and clay-slates, occurring in variable succession, with a north and south strike, and with an almost uniform vertical dip. Here and there, on the edges of these laminated rocks, rest horizontal sedimentary deposits, and it was pointed out that many of these exhibited at the point of contact with the older rocks evidences of their undergoing the process of vertical cleavage or lamination, the lines of stratification becoming gradually obliterated. Here, then, are conditions closely analagous to those we have been endeavouring to point out; and in its effects we have here the very action, detected *in situ*, which in all probability mainly re-arranges entire formations, as the metamorphic gneiss, mica-schist, &c., wholly or partially changing their aspect and character, and often giving a vertical lamina to strata originally left by deposition in a horizontal position. This meridional symetrical structure, due, as Mr. Hopkins maintains, to polar forces, may be very generally observed, both in the igneous rocks and sedimentary deposits; in the former, such north and south cleavage planes are very apparent in portions of the newly-scarped rock on the southern side of Arthur's Seat; and in their more general effects are peculiarly observable in the structural arrangement of the variety of rock so extensively wrought in Wales for roofing-slate, having been, as remarked by Professor Sedgwick, "so modified (by the crystalline forces) that the traces of its original deposition are quite obliterated, and a beautiful crystalline cleavage produced, passing alike through all strata."

Assuredly the varied, complex, and all-potent agencies we have been considering as a part of the great scheme of inanimate Nature, so pregnant with consummate design and beneficient wisdom, constitute a most striking portion of those all-pervading, ever-acting laws and subtle influences, which Humboldt so happily designates "The Life of the Earth," imparting, as he eloquently observes, a real dynamical existence to our globe, instinct with vital power, sustained from perennial resources, and wielding inexhaustible energies.

Although the limits of an article have necessarily precluded me from treating the subject of enquiry in all its bearings and complicated relations with the comprehensiveness its importance demands, I trust that enough has been advanced to exhibit the pregnability of that stronghold of the Plutonists—the basaltic rocks. A citadel which, defended as it is by vested "knights and scribes," of mental strength and energy, enjoying, many of them, popular immunities, acquired most meritoriously beneath the banners of science, can hardly be expected to capitulate or yield without a struggle, tantamount, perhaps, to that exhibited by the pertenacious defenders of Sebastopol. The most acute philosopher, however, in the brief span of existence allotted to isolated fugitive mortal, can at best obtain but a glimpse and very inadequate knowledge of the marvellous displays of creative wisdom which teem throughout the grand arena of Nature, and which "it is the glory of the Creator to conceal;" for, with all our knowledge of the facts of Nature, we are totally in the dark as to a single cause; our faculties enable us to apprehend effects or phenomena, but of ultimate causes we know nothing. To the humblest enquirer, however, they alike display their manifold beauties and their perfections, and even such an one may so have learned to interpret the palpable evidences so universally presented to the cognizance of his senses, that his simplest relation of "things as they are" may, perchance, prove more effective, and do more for the cause of legitimate science, than all the arguments of the most skilful logician and subtle investigator, and which after all, but too often end in *reste à savoir*. And whilst such a reflection inculcates a lesson of humility which the most erudite and confident may learn to profit by, it behoves us all ever to bear in mind that the works and doings of the Omnipotent Architect are, by their extent, by their origin in secret and everlasting counsels, and by their complicated relations, a glorious system, wrapped round with deep mystery, which it is the highest and noblest employment of the most dignified among mankind to investigate, with all the light which Nature, science, or revelation can afford them.

## MINES AND MINERALS OF AMERICA.—No. VI.

BY CHARLES SAMUEL RICHARDSON, C.E.

### THE COAL FIELDS OF ILLINOIS.

It will very naturally be asked, if coal mining is so very profitable, why are there not more engaged in the trade? The answer is a simple one. Every person in this country is a trader; he has generally as much or more business than capital to carry it out, therefore but little to spare for mining speculation. The proprietors of the Kingston collieries are large merchants; they have expended on their coal property probably 20,000*l.* already, and which is now just beginning to pay; it is very likely they cannot conveniently spare more from their usual line of business, therefore are compelled to go along slowly. They are the owners of very extensive tracts of mineral lands, and no doubt would very gladly take in some co-partners to help work them; in fact, I am certain, if they could meet with a respectable English company to join them, they would permit them to come in on first principles. I have often thought of directing the attention of our London mining men to these lucrative means of investment, but having since I left England altogether ceased from entering into any mining speculations myself, I have not thought it worth while to do so, but I should be very happy to tender my advice to any party who might feel desirous of forming a company to work a colliery or other mine in this country. Nearly the whole of my time is spent in travelling, consequently I often meet with properties that may be bought at quite a nominal sum, which if properly set to work would realise immense profits; I have seen during the past winter mineral lands that can now be bought from 8*l.* to 10*l.* per acre, beneath which are seams of good bituminous coal (above water mark), worth on an average to a mining company 750*l.* per acre. Nothing in this country pays so handsomely as a well located coal mine; there is always a greater demand for its produce than the general means of supply. The greatest inconveniences felt are the want of efficient boats and steam-vessels to take the coal to market, and unless a company is amply provided with these, the mines cannot be worked to any great extent. No company working a colliery on the Ohio or Illinois Rivers should start with a capital less than 30,000*l.*, and have 20,000*l.* more at command when the requirements of the works need additional capital for extension; with such, I have not the least hesitation in saying that a well conducted company could readily make an annual dividend of 20 per cent., after allowing an ample reserve fund to meet contingencies.

In leaving Kingston, proceeding up the river, we come to Kickapoo Creek, some nine miles distant. Here are six or eight small mines opened; the coal is the same as at Kingston. They are all worked by tunnel or adit level; I do not think any of them have more than about 10 or 15 men employed. They mostly supply the towns of Peocca and Pokin, and neighbouring villages, who take all they can raise. These small setts are mostly worked by colliers themselves; they take a lease of them by the year, at a royalty of 1 cent per bushel, or 1s. 0½d. per ton, which netts to the lord about 250*l.* per acre: if they were wrought properly it would realise 500*l.* or more per acre, but the men only drive in a few fathoms. When the air gets bad they commence a new level, and allow their workings to run down, consequently no pillars are removed, and one-half the coal left behind. The steady working collier here is in good circumstances; he has nearly constant work, and at 3s. per ton for cutting can make his $45 to $50 (10*l.*) per month easily. Provisions are very cheap, and a man with a family can do well, there being plenty of easy employment for the children of both sexes. From Kickapoo, the coal may be distinctly seen outcropping on all the river bluffs as far as Lacelle and Peru, 70 miles. This is the top of the navigation of the Illinois River, being 220 miles from its entrance into the Mississippi. A canal now commences here, which runs to Chicago, on Lake Michigan, and affords means of conveying the coal to that city at a cheap rate. At Lacelle, there are two coal mines just commenced—one of them has put down a bore below the second seam, and at 122 ft has cut a fine seam of coal, said to be 8 ft. thick An engine-shaft has been contracted for by some Scotch miners, and when I left that part of the country preparations were making to commence the sinking of it. From Lacelle to Chicago the distance is about 100 miles: this is nearly all prairie, or other very slightly undulated land, beneath which I believe the coal seams continue unbroken. About 15 miles from Chicago an opening has been made, and from what I have been informed a good seam of coal has been found quite shallow. If this is the case, there is, then, one entire coal field 300 miles in length by 120 miles in breadth, whose aggregate thickness in its seams is not less than 25 ft.—a quantity sufficient to supply the household consumption of 20,000,000 of people for 2000 years.

Chicago is a large and flourishing city; twenty years ago it consisted of only a few cottages and log cabins, it now contains a population of over 60,000; it is truly astonishing to witness the rapid progress of this City of the Plains. The consumption of coal here is about 100,000 tons per annum, but as the lake steamers have as yet scarcely commenced burning coal, the trade is in its infancy; wood is becoming already very scarce and dear, coal and coke are found cheaper, consequently, in a very short time coal will be generally used on the lakes; then the coal trade of this city will exceed 1,000,000 tons a year, and the owners of good colliers amass great fortunes.

Such is a brief outline of the coal mining of the Illinois; in a convevient period I will furnish you with more detailed statistics, but before doing so I shall give an article on the coal fields of Ohio and Kentucky, and probably the copper mines of Tennessee, which, I perceive by the Journal, are beginning to attract the attention of English capitalists. Well, there is a fine field open to mining enterprise, but, it must not be forgotten, gold can be bought too dear—so can coal and copper mining setts; and my advice to all who write me about American mining properties is—do not be in a hurry in buying; have the setts well examined before you enter into monetary engagements; 100*l.* spent in obtaining an accurate plan of the property, with a report, estimate, and valuation of its mineral features, will not only save you many thousands in money, but a great amount of vexation, doubt, and disappointment.

## "ALUMINIUM," THE NEW METAL.

Marvels (if we may judge from the eager manner in which they are received by the bulk of mankind) are the natural food for the sustentation and quickening of many minds. There are few among us who cannot testify to the charm of a really marvellous story. It is indeed quite vexing, while soaring pleasantly in imagination far from facts and figures, to be brought suddenly, by some friendly monition, into the presence of stern realities, and thereby convinced that we have been merely dreaming. If, however, we do not desire to have our visions thus rudely dispelled, we must choose for our ruminations some field which will not admit of the facile demonstration of the impracticable or impossible. In short, it is injudicious, whatever custom may say to the contrary, to feed the marvellous vein of craving humanity with fictions based upon suppositious progress made in the applied sciences; and that for the simple reason that the deceit, whatever it may be, is so readily discoverable. This, we think, is well understood by all persons engaged in practical science; for whatever class else of the community may take on trust the announcements of wonderful discoveries put forth from time to time, whether they relate to flying machines, the long range, or perpetual motion, we are sure it is not the followers of chemistry or mechanics who place the slightest faith in such fictions. They, however, are subject to fall into an error of an opposite kind, and distrust the value of every suggestion that has not been put to actual trial. This is more especially the case when very important advantages are declared to be attainable by the adoption of some new proposition; for knowing, by experience, how gradual has been the progress in the arts, practical and scientific men are unprepared for great changes; and thus, from their discrediting unattested statements, many valuable discoveries have long been kept in abeyance.

The recent proposition for the adoption into the arts of the metal aluminium, has afforded to the lovers of the marvellous a new subject for speculation. Already its adaptability to a hundred cases is proclaimed, although the difficulty of obtaining it is at present a bar to its use. It is sufficient that the compounds of the metal are capable of being reduced and made to yield the pure metal; that the metal thus obtained is white, tough, not readily oxidisable, and has a lighter specific gravity than iron; and from these facts a world of probabilities as to its ultimate range of application has been put forth. We remember, some years ago, when the great and unexpected yield of copper at the Burra Burra Mines affected for a time the market price of that metal, the public was promised penny pieces as large as dinner plates. But, far from that, copper has actually advanced in price, and that to a permanent and inconvenient degree; while gold—notwithstanding the prophecies respecting the change which the enormous additions made to it of late years would effect in its market price—still retains its relative value amongst the metals, and has hitherto, as far as we remember, found no new application in the arts to the displacement of any other metal; although its natural peculiarities render it eminently adapted to a variety of untried uses. We are led to make these remarks in order to abate public expectation respecting the prominent position that aluminium will quickly take in our manufactures. When a ready means has been found to obtain the metal at a price, numerous difficulties may even then present themselves, and call for the exercise of great ingenuity and patience to master them. This was the case with zinc, which, although well known to the ancients, and employed for so many centuries in the production of alloys, has only of late come into extensive use, owing to the difficulties which had to be encountered in its manipulation. But while many enthusiasts are busy in extolling the merits of aluminium as the latest treasure wrested from the storehouse of Nature, we think it not unlikely that those whose interest its discovery may most nearly concern will, instead of testing its value by experiment, ignore its very existence until it has forced its way into notice. It is just one of those discoveries which no manufacturer could afford to pursue at his own expense, and for the simple reason that he would gain no equivalent for his labour, because all would participate alike with him in the benefit of his researches. We are glad, therefore, to find that the French Government, in its provident care for the advancement of science, has been at the cost of a series of experiments for ascertaining the best means of reducing aluminium from its compounds to the metallic state. It is at present premature to pronounce an opinion as to the future value of this metal in the arts; but as nothing can give a greater impetus to manufacturing industry in its present advanced state than the introduction and use of new natural products, we propose to lay before our readers the gleanings of the foreign journals which treat of the properties of aluminium, and the mode of obtaining it from its natural combinations.

This metal, which, owing to the recent researches of M. St. Claire Deville, is now exciting so much attention, was discovered, or rather its existence was inferred, by Sir H. Davy; and the correctness of his inference was confirmed by M. Wöhler, who obtained aluminium in a pulverulent state by treating its chloride with potassium. By modifying M. Wöhler's process, says M. St. Claire Deville, the decomposition of the chloride may be regulated in such manner as to produce a degree of incandescence that will cause the particles of the metal to agglomerate and take the form of globules. On heating a mass, composed of the metal and chloride of sodium (which is to be employed by preference), in a porcelain crucible, to a lively red heat, the excess of chloride of aluminium will be disengaged, and a saline mass, with acid re-action, will remain, in which will be found globules of perfectly pure aluminium. This metal is as white as silver, and eminently malleable and ductile. Nevertheless, on working it, it is found to offer greater resistance than silver; and it is, therefore, supposed to approach nearer to iron in tenacity. It increases in hardness by being worked, but will regain its former condition by the annealing process. The melting point of aluminium approaches that of silver; its density is 2·56: it may be melted and run off in the open air without undergoing any perceptible oxidation; and it is a very good conductor of heat.

Aluminium is not affected by exposure to either dry or damp air; neither does it tarnish; but it remains perfectly bright, where freshly cut zinc and tin lose their lustre. It is not affected by the action of sulphurretted hydrogen, nor by hot or cold water. Nitric acid, either weak or concentrated, and weak sulphuric acid, when employed in the cold state, do not act upon it. Its true solvent is hydrochloric acid, from which it disengages the hydrogen, and sesquichloride of aluminium is formed. When heated to redness in hydrochloric acid, in the gaseous state, the product is a dry and volatile sesquichloride of aluminium.

It will be easily understood that a metal which is as white and unchangeable as silver, which is not tarnished by exposure to the air, and which is fusible, malleable, ductile, and tenacious, and possesses the singular property of being lighter than glass, would be exceedingly useful if it were possible to obtain it easily. Besides, considering that this metal exists in nature in large quantities, and that its ore is clay, it is much to be desired that the means should be found for bringing it into common use. The investigations of M. St. Claire Deville have led him to hope that this might be the case, as the chloride of aluminium is decomposed with remarkable facility at a high temperature by the common metals; and a reaction of this nature which he is striving, with the encouragement of the French Academy of Arts, to realise on a larger scale than a mere laboratory experiment, will solve the question in a practical point of view.

In a subsequent report, made by M. Deville to the Academy of Arts, he observed that he had caused medals of large size to be struck in aluminium, and also prepared plates of the same, which were not affected by exposure to the air;—and further, that small ingots of the same metal, although handled daily, were found to retain their brilliancy; in fact, this substance was so inoxidisable, that it resisted the action of the air, even when heated in a muffle to the temperature employed for assaying gold.

Aluminium will not form an amalgam with mercury, and it takes up but a very small quantity of lead. With copper, it forms light alloys, which are very hard and white, even when 25 per cent. of copper is used. It also has the peculiarity of forming with carbon a grey casting, which is granulous and brittle, very easily crystallisable, and containing silicium, which is separated therefrom in a state of purity, on continuing the action of boiling hydrochloric acid.

The following are two methods given by M. St. Claire Deville, for obtaining this metal:—

1. SODIUM PROCESS.—Introduce into a glass tube of about an inch in diameter from 200 to 300 grammes of chloride of aluminum, closing the ends with a plug of asbestos; then conduct hydrogen gas, dry, and perfectly free from atmospheric air, into the tube, and heat the chloride of aluminium in this current of gas by means of charcoal. This will have the effect of driving off the hydrochloric acid, chloride of silicium, and chloride of sulphur, with which it is always impregnated. Capsules of as large size as possible, containing each some grammes of sodium, previously crushed between two sheets of dry filter paper, are then introduced into the glass tube. The tube being full of hydrogen, the sodium is melted; and the chloride of aluminium on being heated, will be distilled and decomposed with incandescence, which may be easily moderated. The operation will be complete when all the sodium has disappeared, and the chloride of sodium formed, has absorbed a sufficient quantity of chloride of aluminium to saturate it. The aluminium will now exist in the state of a double chloride of aluminium and sodium, which is a very fusible and volatile compound. The capsules are next to be removed from the glass tube, and placed in a large porcelain tube, furnished with a pipe leading to a receiver. Through this porcelain tube, while heated to a lively red heat, a current of hydrogen, dry and free from air, is caused to pass; and the chloride of aluminium and sodium will be thereby distilled without decomposition, and collect in the receiver. After the operation, all the aluminium will be found collected in the capsules in the form of large globules; these are washed in water, which will carry off a little of the salt produced by re-action, and also some brown silicium. In order to form a single mass of all these globules, after being cleansed and dried, they are introduced into a capsule of porcelain, into which is put, as a flux, a small quantity of the product of the preceding operation—*i. e.*, of the double chloride of aluminium and sodium. On heating the capsule in a muffle to the temperature of about the melting point of silver, all the globules will be seen to unite in a brilliant mass, which is allowed to cool, and then washed. The melted metal must be kept in a closed porcelain crucible until the vapours of the chloride of aluminium and sodium with which the metal is impregnated have entirely disappeared. The metallic mass will then be found surrounded by a light pellicle of alumina arising from the partial decomposition of the flux.

2. PROCESS BY MEANS OF GALVANISM.—This process is carried on by means of the double chloride of aluminium and sodium. For this purpose the aluminium bath is prepared by taking two parts by weight of chloride of aluminium, and adding thereto one part of dry pulverised marine salt. The whole is mixed in a porcelain capsule, heated to about 200°. The combination will soon take place, with disengagement of heat. The liquid thus obtained is to be introduced into a capsule of glazed porcelain, which is maintained at a temperature of about 200°. The negative electrode is a plate of platinum, upon which the aluminium will be deposited, mixed with marine salt, in the form of a greyish layer. The positive electrode consists of a porous vessel, perfectly dry, and containing melted chloride of aluminium and sodium, in which is immersed a cylinder of charcoal, which generates the electricity, and to which pass the chlorine, and a small quantity of chloride of aluminium, arising from the decomposition of the double salt. The double fixed chloride is re-constituted, and the vapours cease. A small number of elements are necessary for decomposing the double chloride, which presents but slight resistance to the action of electricity.

When the platinum plate is sufficiently charged with metalliferous deposit, it is removed, and allowed to cool; the saline mass is then cleaned off, and the plate again introduced into the current. The matter thus detached from the electrode is melted in a porcelain crucible, which is enclosed in an earthenware one; and after cooling, it is treated with water, which dissolves a large quantity of marine salt; and a grey metallic powder is obtained, which is, by several successive meltings, formed into a single mass; the double chloride of aluminium and sodium being employed as a flux for that purpose.

The first portions of metal obtained by this process are nearly always brittle; as fine a product may, however, be obtained by it as by the sodium process; but the chloride of aluminium employed for that purpose must be purer. In fact, by the sodium process, the silicium, sulphur, and iron are carried off by means of the hydrogen,—the iron passing off in the state of protochloride; whilst all these impurities remain in the liquid which is decomposed by the battery, and are carried off along with the first portions of metal reduced.

In addition to these processes of M. Deville, we are enabled to add—

M. BUNSEN'S METHOD OF PREPARATION.—Take oxide of aluminium, obtained either by the calcination of ammoniacal alum, or from sulphate of alumina, or by the decomposition of alum by chloride of barium; and having mixed it with charcoal, introduce the mixture into a stone retort capable of containing about two quarts, and cover it with a thick layer of cement composed of argil and iron scales. Place the retort in a reverberatory furnace, with its neck projecting horizontally therefrom, from 3 to 5 inches, and connect this neck with a glass receiver, for the reception of the chloride of aluminium, which is sublimed on the introduction of chlorine. This gas is introduced into the glass receiver by a tube of large diameter, made of glass not easily fusible. The stone retort is heated to a dull red heat, and a current of chlorine (well washed and dried) is caused to pass therein. Chloride of aluminium is then freely formed; and at the expiration of some hours the receiver will contain at least half-a-pound of product. When this chloride has well cooled, it is mixed with its equivalent of melted and pulverised chloride of sodium, and heat is applied thereto. The mixture will melt at a temperature below 200° centigrade. It is introduced into a closed porcelain crucible, divided into two compartments by a porcelain partition which does not quite reach to the bottom, and closed by means of a porcelain cover, having two holes for the reception of the conductors of the battery. Six or eight pairs of Bunsen's plates will suffice to separate the aluminium. If the temperature remains at 200° centigrade, the metal will be deposited in the state of powder; and, for the purpose of converting this into a compact mass, pulverised chloride of sodium is gradually introduced into the mixture, until the liquid has reached the temperature of the melting point of silver. After cooling, large balls of aluminium will be found in the mass, which are caused to unite by throwing them into melted sea salt. The ingots thus obtained possess all the characteristics of M. Deville's aluminium.

These processes, it will be understood, are suited rather for the laboratory than for the requirements of the arts; but we hope ere long to be able to present our readers with a more practicable plan for obtaining an abundant supply of the metal.*

YELLOW BRASS.—The following table exhibits the composition of several varieties of this species of brass:—

| Metal. | No. 1. | No. 2. | No. 3. | No. 4. | No. 5. | No. 6. | No. 7. | No. 8. | No. 9. |
|---|---|---|---|---|---|---|---|---|---|
| Copper | 61·6 | 64·6 | 64·8 | 63·70 | 64·45 | 70·1 | 70·29 | 71·89 | 70·16 |
| Zinc | 35·3 | 33·7 | 32·8 | 35·55 | 32.44 | 29·9 | 29·26 | 27·63 | 27·45 |
| Lead | 2·9 | 1·4 | 2·0 | 0·25 | 2·85 | — | 0·20 | — | 0·20 |
| Tin | 0·2 | 0·2 | 0·4 | 0·50 | 0·25 | — | 0·17 | 0·85 | 0·79 |
| Total | 100·0 | 100·0 | 100·0 | 100·0 | 100·0 | 100·0 | 100·0 | 100.0 | 100·0 |

No. 1 is a cast brass, of uncertain origin.
No. 2 is the brass of Jemappes.
No. 3 is the sheet-brass of Stolberg, near Aix-la-Chapelle.
No. 4 and 5, the brass for gilding, according to De Arcet.
No. 6, the sheet-brass of Romilly.
No. 7, English brass-wire. [Berlin.
No. 8, Augsburg brass-wire.
No. 9, the brass-wire of Neustadt, Eberswald, in the neighbourhood of

SILVER STEEL consists of 1 part silver, 500 parts steel, according to Faraday and Stodan. This alloy would be superior to the best steel. Steel also combines with other metals, such as nickel, platinum, manganese, &c.

* From *Newton's Journal of Arts and Sciences.*

## ON BRITISH MINING, AS AN INVESTMENT.

In September, last year, we drew public attention to the subject of British Mines as a profitable medium of investment. What has the year ending the 31st August resulted in? At war with Russia twelve months since, we are still unable to master Sebastopol, or apparently subdue the aggressive spirit of the Czar. A year since, commerce became paralysed with the gloomy prospects presented for the future, and our cleverest merchants were sadly disappointed in the results of their operations—in fact, the social relations of Europe were outraged, and confidence in those most closely associated together became weakened; hence the trade of the country was restricted, and the onward progress of civilisation stopped. The mines of Cornwall and Devon, however, stand boldly out in relief as an exception to this unfortunate stagnation: they continue to yield vast returns, and to declare large dividends from actual profits made, whilst the current price of shares advance, and the market value of the several metals produced is more than fully maintained. The value of fine copper the last week in August, 1854, was from 126*l.* to 129*l.* per ton; it is the same at the end of August, 1855. Lead in August, 1854, and in August, 1855, was the same—viz., from 23*l.* to 24*l.* per ton; whilst tin, only 114*l.* to 115*l.* in August, 1854, has advanced to from 126*l.* to 127*l.* per ton in August, 1855, and likely still further to improve. The miner is receiving a better price for his ores at this time than previously to the war with Russia. At the Cornish ticketings, the standard for copper ores on the 31st of August, 1854, was 142*l.* 16s.; at the sale on Thursday, the 30th August, 1855, it was 151*l.* 15s. The produce upon the two occasions varied $\frac{3}{8}$ per cent., it having been $5\frac{7}{8}$ upon the former, and $5\frac{1}{4}$ upon the latter. The price per ton of 21 cwts., however, was the same—namely, 5*l.* 13s.; this shows an advance of $6\frac{3}{4}$ per cent. during the year. The improvement in current value of many dividend and sound progressive mines is still more forcibly demonstrated, as will strikingly appear by a reference to the undermentioned cases:—

| Mines. | August 31, 1854. | August 31, 1855. |
|---|---|---|
| Basset | 600 | 710 725 |
| South Frances | 270 | 650 660 |
| Bedford United | 8½ | 12 |
| North Basset | 15 | 29 30 |
| North Crofty | 6 7 | 9 10 |
| Providence Mines | 18 | 45 |
| West Seton | 220 | 285 290 |
| Boiling Well | 12 | 17½ 20 |
| Carnyorth | ¾ | 2 |
| Clijah and Wentworth | 9 | 19 |
| East Basset | 24 | 45 |
| Buller and Basset United | 1¼ | 5 |
| East Buller | 4 | 8 9 |
| Great South Tolgus | 2 | 6 |
| Lelant Consols | 5 | 10 |
| Kitty (Lelant) | 5 | 40 |
| North Robert | 10 | 30 32 |
| Sortridge Consols | 1½ | 6 7 |
| Rosewarne United | 22 | 235 |
| West Frances | 21 | 24 |
| Trefusis | 3 | 10 |
| Wrey | 4 | 8¼ |

Other instances may be enumerated, of investments in British mines proving equally profitable to the above during the past year to those associated therewith, but the limits of our present review preclude allusion thereto. We may as well add, however, that capitalists will do well to direct their attention to the following companies, which sell in most cases at considerable discounts, and far below their intrinsic value. We can assure our subscribers that we form our conclusions either from personal investigation, or the reports of approved and practical agents and correspondents, resident in, and acquainted with, the several mineral districts in which the mines are situated; and although it may be desirable for capitalists to consult us personally before investing their money, as there exists a wide difference betwixt the respective merits of those alluded to, yet it may be inferred as a general rule that brokers and others advocating the subjoined mines will not prove far wrong in their judgment:—

| Mines. | Shares. | Amount pa'd. | Price. |
|---|---|---|---|
| Great Alfred | 1024 | £42 18 5 | 18 19 |
| Great Fortune | 1024 | 18 3 9 | 9 10 |
| Clowance Mines | 256 | 15 12 6 | 75 77½ |
| Hender | 1024 | 0 5 6 | 5 |
| Buller | 256 | 5 0 0 | 690 700 |
| North Busy | 1024 | 4 0 0 | 6½ 7 |
| Alfred Consols | 5120 | 2 11 10 | 12½ |
| Camborne Consols | 1000 | 3 10 0 | 6 |
| Carvannal | 1056 | 15 0 0 | 8 |
| East Caradon | 6144 | 1 16 0 | 1½ |
| West Caradon | 256 | 20 0 0 | 160 |
| South Caradon | 256 | 2 10 0 | 315 |
| Balnoon Consols | 940 | — | ½ |
| Trelushack | 1024 | 14 0 0 | 1 |
| East Margaret | 1024 | 5 17 6 | 8 9 |
| East Rose | 1085 | 35 0 0 | 27 |
| Exmouth and Adams | 5700 | 4 14 0 | 7½ 8 |
| Forest | 512 | 6 0 0 | 8 9 |
| Great Vor | 26666 | 5 0 0 | 4½ 5 |
| Leeds Town Consols | 10215 | 3 9 0 | 1¼ |
| Pedn-an-drea United | 10000 | 1 0 0 | 2 3 |
| St. Day United | 20000 | 2 0 0 | 2 |
| West Alfred Consols | 1024 | 25 7 8 | 20 |
| West Basset | 6000 | 1 10 0 | 31 |
| West Sharp Tor | 256 | 62 0 0 | 100 |

We subjoin herewith the dividends declared by 44 Cornish and Devon Mines, from Sept. 1, 1854, to Aug. 31, 1855, as far as we have been enabled to ascertain the particulars: the figures, however, may be taken as a very close approximation to the truth. It would, however, be much more satisfactory to us, and conduce more to the advantage of mining, if many of the pursers and managers of mines were to exhibit a more ready desire to furnish correct statistics of the companies with which they stand connected:—

| Mines. | Shares. | Paid. | Div. per share. | Total div. |
|---|---|---|---|---|
| Devon Great Consols | 1024 | £ 1 0 0 | £ 55 0 0 | £56,320 |
| Basset | 256 | 10 5 0 | 137 10 0 | 35,200 |
| Buller | 256 | 5 0 0 | 140 0 0 | 35,840 |
| West Basset | 6000 | 1 10 0 | 3 15 0 | 22,500 |
| South Frances | 248 | 37 17 6 | 54 0 0 | 13,392 |
| North Basset | 6000 | *Nil.* | 2 15 0 | 16,500 |
| South Caradon | 256 | 2 10 0 | 48 0 0 | 12,288 |
| West Seton | 200 | 77 0 0 | 30 0 0 | 6,000 |
| West Caradon | 256 | 20 0 0 | 20 0 0 | 5,120 |
| Alfred Consols | 5120 | 2 11 10 | 1 14 0 | 8,704 |
| Bedford United | 4000 | 2 6 8 | 1 6 0 | 5,200 |
| Condurrow | 256 | 20 0 0 | 3 0 0 | 768 |
| Providence Mines | 560 | 20 12 6 | 8 5 0 | 4,620 |
| United Mines | 400 | 40 0 0 | 3 0 0 | 1,200 |
| West Providence | 1024 | 5 0 0 | 1 15 0 | 1,792 |
| South Tamar | 9000 | 1 6 6 | 0 16 0 | 7,200 |
| Great Crinnis | 30000 | 1 0 0 | 0 1 0 | 1,500 |
| Great Vor | 26666 | 5 0 0 | 0 5 0 | 6,666 |
| Trehane | 2048 | 0 15 0 | 1 5 0 | 2,560 |
| West Damsel | 256 | 10 7 0 | 10 0 0 | 2,560 |
| Treavean | 96 | 32 10 0 | 17 0 0 | 1,632 |
| Polberro | 1000 | 15 0 0 | 1 1 0 | 1,050 |
| Botallack | 200 | 91 5 0 | 25 0 0 | 5,000 |
| Carn Brea | 1000 | 15 0 0 | 2 0 0 | 2,000 |
| Owles | 80 | 70 0 0 | 14 0 0 | 1,120 |
| Trelawny | 520 | 8 17 6 | 2 10 0 | 1,300 |
| Arthur | 1228 | 7 0 0 | 2 10 0 | 3,070 |
| Hingston Down | 6000 | 3 7 6 | 1 3 6 | 7,050 |
| Great Work | 119 | 100 0 0 | 5 0 0 | 595 |
| Exmouth and Adams | 5700 | 4 14 0 | 0 2 0 | 570 |
| Trumpet Consols | 100 | 95 0 0 | 5 0 0 | 500 |
| North Pool | 200 | 22 10 0 | 6 0 0 | 1,200 |
| Wrey | 4096 | 1 9 0 | 0 12 0 | 2,457 |
| Charlotte | 1024 | 3 15 0 | 1 0 0 | 1,024 |
| Levant | 160 | 2 10 0 | 6 0 0 | 960 |
| Rosewarne United | 256 | 24 0 0 | 15 0 0 | 3,840 |
| Clifford | 250 | — | 2 13 3 | 665 |
| Margaret | 112 | 79 0 0 | 3 0 0 | 336 |
| East Pool | 128 | 32 0 0 | 5 0 0 | 640 |
| Great South Tolgus | 6000 | 2 10 0 | 0 2 6 | 750 |
| Spearne Moor | 280 | 14 0 0 | 1 0 0 | 280 |
| Bal | 240 | 6 10 0 | 1 0 0 | 240 |
| Carnyorth | 2048 | 3 0 0 | 0 3 0 | 307 |
| Wellington | 1024 | 8 5 0 | 0 2 6 | 128 |
| Total | | | | £282,644 |

BASSET MINE commanded a current value of 600*l.* per share in Sept. last, and is now selling for 715*l.* to 725*l.*, 10*l.* paid only. During the year just ended six bi-monthly dividends have been declared, amounting to 137*l.* 10s. per share, or 19 1-5th per cent. upon the present value. This company consists of 256 shares, and is conducted upon the Cost-book System. The situation of this mine is between the Buller and South Frances, the Buller and Basset United adjoining it on the south, and the North Basset on the north; it is the oldest of the Basset group of mines, now the richest for copper in the world. The dividends yielded up to 1845, 35,840*l.*; 1846, 1280*l.*; 1847, —; 1848, 1280*l.*; 1849, 6400*l.*; 1850, 14,080*l.*; 1851, 15,360*l.*; 1852, 21,760*l.*; 1853, 30,720*l.*; 1854, 34,560*l.*; 1855, to end August, 22,400*l.* = 183,680*l.* A new lease for 21 years, from 1851, was favourably obtained, and the property is regarded by practical miners as one of first importance, and of the most permanent character. The plant of machinery is good and ample, and calculated to answer the requirements of the company for many years to come. It yields from 60,000*l.* to 65,000*l.* annually in copper and tin, chiefly the former. The lodes are numerous, traversing the grant from east to west, intersected by cross-courses passing from north to south. The deposits of ore are large, and the quality good, whilst the reserves are above those usually kept in first-class mines, especially when the facilities to discharge and dress the ores are so complete as in this instance; in fact, the mine is worked for permanent profits, and the only query is, whether larger annual returns and profits ought not, in justice to the shareholders, to be made.

SOUTH FRANCES MINE adjoins the Basset and the Buller and Basset United; the channel of strata is alike in all cases, the same north and south cross-courses and measures passing from one to the other. We drew especial attention to this property a year ago, when the shares, 248 in number, sold for 270*l.* only: the present price is 640*l.* to 660*l.*, and will further advance. It is conducted upon the Cost-book System, under the supervision of a committee, the local purser being John Cadey, Esq., and the manager Captain William Pascoe. The accounts of this company are not only well kept, but are quoted as a correct example of the favourable working of the Cost-book System, in juxta-position to others less regularly kept. The engine-shaft is 160 fms. under the adit level, the water being drained by a 75-in. pumping-engine. The ores are drawn to surface by a steam-whim, and four water-stamps return the tin ores, produced chiefly from the backs of the several lodes. Five lodes have been opened upon, but the engine lode has been most wrought of either, and has yielded the greater portion of profits yet divided, which amount to the sum of 76,198*l.*, in the following manner:—For the year 1845, 992*l.*; 1846, 744*l.*; 1847, 9796*l.*; 1848, 5704*l.*; 1849, 7192*l.*; 1850, 10,478*l.*; 1851, 10,416*l.*; 1852, 6696*l.*; 1853, 6076*l.*; 1854, 7440*l.*; to Sept. 1855, 10,664*l.*: total, 76,198*l.* A lode to the north has been opened upon for a considerable length, and fully 180,000*l.* worth of ores are held in reserve here; whilst two other lodes still further north are proved to be productive, and hold out unusual prospects of success. In the south part of the grant little has been done in opening up the lodes: William's lode, however, is proved to be productive, and at no very distant day immense stores of wealth will be discovered to exist in this channel of virg'n ground as well. The area of the sett is most extensive, and whilst the dividends will annually increase, the present system of working will not exhaust the property for centuries to come. Much larger returns might legitimately be made, and few entertain any question that the profits will shortly exceed either Basset or Buller, her neighbours. The next bi-monthly dividend will be 17*l.* 10s.

BULLER MINE is a continuation of the South Frances and Basset Mines, the same lodes traverse the three setts. It is situated about 200 fathoms north of the Penstruthal Mine, and 225 fathoms north-east of the Buller and Basset United grant, which is traversed by the lodes both of Penstruthal and Tresavean. The Buller sett is about 600 fathoms in length and 300 to 350 in width. It was put to work as recently as the year 1848, under the supervision of the Messrs. Davey, of Redruth, in which parish it is situate. In its progress no mine in Cornwall has been so rapidly developed of late years, and placed so soon at the head of produce and profits. The principal lode became productive at a shallow depth, yielding 20 tons of ore per fathom, at 20 fathoms only below the adit level. The company consists of 256 shares, 5*l.* paid, and the profits declared amount to 173,120*l.*, paid as follows:—Dividends declared in 1849, 2560*l.*; 1850, 13,120*l.*; 1851, 17,920*l.*; 1852, 24,960*l.*; 1853, 45,440*l.*; 1854, 53,760*l.*; 1855, Aug. 31, 15,360*l.* = 173,120*l.* The price of shares has very much fluctuated: at one time it ranged as high as 1200*l.*; in Sept. last year the price was 800*l.*, from which it receded to 450*l.*, but very few sellers were found to accept the price. Force of improvements in the mines and dividends paid have improved the value to 690*l.*, 700*l.*, per share; and it is very probable that it will still advance 200*l.* or 300*l.* per share, and increase the dividends proportionally. We have at all times advocated this, the Basset and South Frances, as desirable and sound sources for investment, holding forth every prospect of permanent and increased dividends; whilst the Buller and Basset United, now selling for 5*l.* per share, West Frances 22*l.* to 24*l.* per share, and East Basset 45*l.* to 47*l.* 10s. and 50*l.* per share, all adjoining, and holding out unusual prospects of success, are especially deserving the notice of capitalists, presenting a wider range for speculation; however, without a corresponding risk of loss. And the more we inspect the locality, and examine the indications presented, the more fully we are satisfied that our recommendation is justified.

BULLER AND BASSET UNITED MINES, consisting of 6400 shares, 25s. paid, selling for 5*l.*, is best explained by the following statement of accounts and report:—

| | | |
|---|---|---|
| CR.—By balance in hand, June 23, 1855 | | £2935 9 8 |
| DR.—To cost for June, 1855 | £194 7 3 | |
| To ditto, July | 179 17 0 | = 374 4 3 |
| CR.—Balance unexpended, August 18, 1855 | | £2561 5 5 |

At a meeting of shareholders, duly convened, and held at the account-house upon the mine, on this 18th day of August, 1855, a statement of the financial position of the company was submitted, showing a credit balance in favour of the company of 2561*l.* 5s. 5d., with all the liabilities charged and paid up to the end of July last.

Resolved—That the same, having been examined, be approved and passed.

Resolved—That Mr. R. Tredinnick's report be approved of, adopted, and printed for circulation amongst the shareholders.

"I have much pleasure in handing you the following report of the progress made in developing these mines. The engine-house is completed, and most of the engine erected. The shears and capstan are upon the ground, and will be fixed in a few days. Vickers' shaft is sunk as deep as the water will admit, until the engine works, cased up and ready for the 12-inch pitwork, which will be fixed in another week, and thus prevent any further delay transpiring than is absolutely necessary for the engineers to complete the erection of the engine. Tredinnick's flat-rod shaft is cased up and completed to the adit level, and in three weeks the flat-rods and pitwork (9-inch) will be in order here also for active work. The water 20 fathoms deeper will then, in another month, be out, and the workings thoroughly cleared up. Capt. Martin, who is present with you this day, will explain that he was formerly captain of the mine, when worked under the name of Hotton Downs; and when, from force of adverse circumstances, it became suspended, 25 years since, the lode in the bottom of this shaft was 3 feet wide, 1 foot of which contained a strong mixture of good quality copper ore; and that, in his opinion, it was the chimney of a large deposit of ore in depth. A few weeks will test this statement, and if found so to exist, the company will at once become of first and vast importance. Buller and Basset, which immediately adjoin, became productive at about the same depth from surface, and the former, upon an outlay of 1280*l.*, has already divided 176,896*l.*, and is selling for the large sum of 180,000*l.*; whilst the latter, upon an outlay of 2816*l.*, has netted profits amounting to 176,640*l.*, and at present commands a market value of 185,600*l.* The cross-courses of both traverse the Buller and Basset United grant, and the stratum is very similar—viz., a strongly-mineralised decomposed granite. Hinde's shaft is also cleared up and timbered to the adit level, and is situate in a good position to command the ground adjacent to the great cross-course, where deposits of rich ores may confidently be relied upon. The backs of the three lodes opened upon consist of gossan, quartz, and iron pyrites, containing spots and indications of copper in depth, strongly tinged with greens almost close to the surface. The account and material-houses, smiths and carpenters' shops, with a house for the pitmen to live in upon the mine, are all completed. And, in conclusion, I am happy to inform you that, after paying every liability up to the end of July, a balance of 2561*l.* 5s. 5d. remains unexpended."

TRESAVEAN MINE has divided during the past 12 months 17*l.* per share, and are now (96 in number) marketable at 150*l.* The following extract from our review of mining for the six months ending June last, will fully explain the property:—"Abandoned twice as a failure, was re-worked by the late Capt. Teague, who persevered in exploring it, and, upon an outlay of 1000*l.*, discovered its immense wealth, whilst its continued prosperity offers another instance of successful mining adventure. This mine is a dry one; the lodes, so profitable in granite, become unproductive upon passing into killas—the junction of strata taking place in the sett. Under different companies it has divided profits exceeding 800,000*l.* From the year 1814 to June, 1843, it returned the enormous quantity of 307,970 tons of copper ore, which realised 1,897,735*l.* 7s. 6d. At present it is divided into 96 shares, worth 150*l.* per share—32*l.* 10s. paid: they at one time sold so high as 2750*l.* each, and up to the end of June last divided 4677*l.* 15s. per share amongst the fortunate shareholders. The dividends were suspended, however, from 1847 to 1854, when 480*l.* was divided, and for the half-year ending June last, 480*l.* more has been divided, and it promises to pay regularly in future. The highest amount of dividends paid was in the year 1833, when 60,480*l.* was divided amongst the shareholders. At this time the shares were negotiable at 2000*l.* each—20*l.* paid: this amount of profit has since been exceeded by the Devon Great Consols, which declared dividends in 1853 amounting to 65,024*l.*, and is saleable (June, 1855) at the enormous sum of 580,000*l.*, having paid in dividends from 1844 to June, 1855, inclusive (a period of 11½ years), the large sum of 452,608*l.* But, returning to the former mine, in 1834 it divided 57,040*l.*; in 1836, 48,000*l.*; in 1839, 33,000*l.*; in 1840, 18,720*l.*; from which period they gradually diminished for seven years, when they ceased altogether. These lodes have also been profitable in the adjoining mines of Trethellan and Treviskey and Barrier."

PEDN-AN-DREA UNITED is situated in Redruth, embracing the two mines of Pedn-an-drea and Sparnon, and is essentially a tin mine, although deposits of copper will probably be met with in depth. The lord's dues, 1-18th, should be reduced to a 22nd. The old works at Pedn-an-drea are 90 fms. below the adit level, which is 34 fms. from surface. A 70-inch pumping steam-engine has been erected, and the pitwork is good, and large enough to drain the water to the bottom. The water is in fork to the 70 fm. level, where the lode is discovered to be very productive; in fact, the best course of tin existing in Cornwall is at this mine—it has been variously estimated at 150*l.* to 250*l.*, 300*l.*, and 400*l.* per fathom. The lode has been opened upon for 6 fms. in length and 10 ft. wide, and no north wall found; the stuff, as broken, is worth 27s. 6d. per barrow. If at the next level and the other side of the slide the lode proves equally productive, the mine must yield immense returns and profits. The company consists of 10,000 shares, 1*l.* paid, and the shares are in demand at 2¼, 2⅜, and 2¾. A call of 20s. per share ought to be made forthwith, to defray the heavy expense incurred in erecting powerful machinery, upon which the mine would stand every chance of shortly paying dividends, and ranking as one of the first mining properties in Cornwall. The returns cannot be correctly estimated, as only enough is realised to defray the labour cost, the residue accumulating upon the surface. Local capitalists are anxious buyers of shares. A steam stamps is in course of erection, capable of lifting 100 heads, although 48 only will be used at starting; a steam drawing-whim is also being erected, whilst the plant of machinery and surface erections are generally in a forward state.

CONDURROW, consisting of 256 shares, 20*l.* paid, and selling for 112*l.* to 115*l.* per share, has much disappointed the expectations of the public; it has paid only one dividend of 3*l.* during the past year. It is situate in the Granite Hill, parallel with Wheal Harriet and the Dolcoath Mines; the ground is very hard, and much time and money is required to develop the lodes: something better ought to be expected from the discoveries made, and the indications presented of greater productiveness in depth. It is under the sole management of Capt. Nicholas Vivian, who has erected a very efficient field of machinery, and laid out the underground works with much practical judgment. The profits declared up to this period amount to 14,848*l.*, or 58*l.* per share.

FOREST MINES.—Adjoining Buller and Basset United and South Frances Mines, divided in 512 shares, 6*l.* paid; selling at a trifling premium, conducted upon the Cost-book System, and managed by Mr. John Rule, one of the committee of South Frances Mine, possesses unusual prospects of success, as the great cross-course passes through the sett which made so much ore in Seton, North Roskear, North Crofty, Cook's Kitchen, Dolcoath, West Basset, and South Frances Mines. All legitimate adventurers in mines should hold a share in this company.

EAST BULLER.—Consisting of 2000 shares; present value 8*l.* 10s. to 9*l.*; well held by resident local shareholders. Two cross-cuts, one in the 60 and another in the 80 fathom level, are being driven to intersect a lode of great promise, and should a course of ore be met with the price will very considerably advance; the calls in case of failure will be very small. A few shares here may do much good, without a corresponding risk.

WEST FRANCES adjoins South Frances and West Basset, under the management of Mr. Robert Pike, and is regarded with considerable interest by parties conversant with mining matters. The sett is small, but exceedingly well placed, and the shaft has attained a depth at which mines in this district usually become productive. The company consists of 512 shares, 23*l.* paid—price 22*l.* to 24*l.*

EAST BASSET, adjoining North Basset and Buller Mine, small in comparison with most of the mines in this district, is valuable chiefly from the depth of the shaft, and the peculiarly favourable position in which it stands. The lode will shortly be intersected by a cross-cut some 70 fms. deep; and if not productive, it will be a singular and unhappy freak of Nature. The company consists of 256 shares, 36*l.* paid; present market value, 45*l.* to 47*l.* per share. Conducted upon the Cost-book System, and very respectably held.

CLIJAH AND WENTWORTH has long since been a favourite in the London market, consisting of 1024 shares, 14*l.* 10s. paid; present price, 17*l.* to 18*l.* Managed by Mr. R. Pike. It has all that analogy, position, and sound practical management, can give in its favour.

GREAT ALFRED, situate in the parish of Phillack, and to the west of Alfred Consols, is worked for the third time: it was first suspended about fifty years ago, after having yielded above 3,000,000*l* worth of copper, and divided, upon a comparatively small outlay, 380,000*l.* amongst the fortunate adventurers. In the year 1822, operations were resumed by the Messrs. Taylor; but the panic of 1825 and 1826 compelled them to abandon it, with every prospect of success, with an expenditure of from 25,000*l.* to 30,000*l.* more. About four years ago a company was formed, consisting of 1024 shares, 3*l.* paid, and we regret to add the shares soon sold for immense premiums, and more attention was devoted to market operations than working the mine. The result is much dissatisfaction and disappointment, as the shares are now (41*l.* 18s. 9d. paid) selling for 18*l.* to 19*l.* only. A 90-inch steam pumping engine is at work, and a 65-inch engine is in course of erection upon Copper-house shaft, which is cut down and secured to the 147 fm. level. The works are very extensive on the course of the main lode, and the shaft is being sunk to the 150 fm. level: the chief objects are to go 20 fms. deeper, and push two 10 fm. levels under the former deposit of ore, which is anticipated to hold good in depth, extend cross-cuts north and south, and open up the side lodes known to exist, but upon which little or nothing has been done by former adventurers. To effect these operations additional capital will be required, to the extent of from 25,000*l.* to 30,000*l.*, and two years in time; and it appears to us that this valuable property is very similarly situated to what it was in the panic of 1825; and unless something be done to lay open the lodes upon a more extended and systematic principle, the sooner the operations are again suspended the better for all parties interested. Why not subdivide the mine into 20,000 shares, and issue 15,000 to the public, at 2*l.*, instead of making bi-monthly calls, inadequate for the purpose of working the mine effectively, and which the shareholders reluctantly respond to; if this suggestion be adopted, we will invest 1000*l.* in new shares, and hundreds will follow the example. The grant is of great value, and the plant of machinery extensive, although inadequate. Subscribe funds, and develop the lodes rapidly and with economy, and great profits will result; creep on a bare existence, as at present, and all will end in nothing.

ALFRED CONSOLS.—The engine-shaft is sunk to the 140 fm. level, and the lode presents a very favourable appearance for ore in depth. A winze sinking under the 130 is worth 65*l.* per fathom, and the end driving east is worth 60*l.* per fathom, and has already been extended 3 fms. in length beyond the one in the 120, which promises well for a continuance in depth of the ore east of the flookan. The pitches throughout the mine look well. This mine adjoins Great Alfred on the west, and Herland Mines on the east; it is about 360 fms. long from east to west, and 1000 to 1200 fms. wide. The grant is traversed by several lodes; the one chiefly wrought is intersected by a cross-course, 120 fms. from the western boundary, and by the great flookan 50 fms. further east; this latter has great influence on the lode—in fact, it can be traced through South Alfred, Tremayne, West Abraham, Leeds Town Consols, East Godolphin, Boladdus Downs, Great Vor, Great Fortune, on to Penrose, and in each has made large and profitable deposits of ore and tin. The deposit of ore at Alfred Consols has extended 45 fms. in length—in the 60 fm. level it was worth 20*l.* to 30*l.* per fm.; 70 fm. level, 50*l.* to 100*l.*; 80 fm. level, 30*l.* to 50*l.* and 100*l.* per fm.; in the 90 fm. level it was of equal value. In the 100 fm. level the lode improved, and from thence to the 110 fm. level it was worth from 100*l.* to 200*l.* per fm; in the 120 fm. level the lode was not so valuable; in the 130 fm. the lode is opened for 30 fms. in length, and is worth, as stated, above 60*l.* per fm. The south lode passes through the north

lode in the 80 fm. level some 8 or 10 fms. west of the flookan, and in the 130 fm. level 45 fms., or close to the engine-shaft, and has proved productive from one level to the other. This latter lode has not been seen east of the flookan, nor, in fact, has the north lode, excepting in the 80 fm. level, where it is worth 9*l.* per fm. (8 fms. in length opened). A cross-cut is being extended to cut this lode in the 60 fm. level, and will shortly be intersected; if successful in finding a good lode, it will very considerably enhance the value of the property, as it stands in virgin ground for 160 fms. in length. Two other lodes have been seen in the adit level north of the north lode, but remain unwrought in depth. In the south part of the mine, full half a mile of ground remains unwrought, excepting at Nicholl's shaft, which has been sunk 20 fms. under the adit level, and a cross-cut extended 10 fms. north and 20 fms. south, and then abandoned, although good stones of ore and tin were found near a cross-course upon a small branch, probably a leader to a lode nigh at hand. The machinery consists of 60 and 80-inch pumping engines, the latter only recently set at work, equal to carrying the mine 100 fathoms deeper; two steam-whims are also at work, with a crusher attached to one of them—in fact, the plant and machinery are ample for ten years to come, and all apprehensions of excess of water by cutting through the eastern flookan being dispelled, the prospects of the company are considerably improved. The profits divided up to the 31st August last amounted to 70,088*l*, and for the year thus ending, two 8s., and four 4s. dividends have been paid. Considerable fluctuations in the price of shares have taken place, varying from 28*l.* to 12*l.* 10s. per share. The prospects of the mine have lately improved, yet the shares do not advance.

THE ROSEWARNE UNITED MINES are situate in the parish of Gwinear, in the county of Cornwall, about one mile north of Clowance Park Gate, and adjoins the Clowance Mines, divided into 256 shares, 15*l.* 12s. 6d. paid, and now selling for 75*l.* to 77½*l.* The Rosewarne United Company consists of 256 shares, 24*l.* paid, which sell for 235*l.* per share in the London market. The progress and development of this property has been very rapid, and much discussion has transpired, and doubts at present exist as to the permanency of the deposit of ore in depth, consequent upon its extreme richness at the shallow levels. In September last year the shares stood at par; October, 55*l.*, November, 65*l.*, and at the end of 1854, 75*l.*; from which they have risen in eight months to 235*l.* A small pumping engine is at work, but is not situated in the best position to drain the works, and it is in contemplation to erect another of more powerful dimensions. A whim engine is also at work; at the 12 fm. level, going west, the lode is worth 40*l.* per fm., and the lode for 30 fms. in length varies betwixt this and the 22 fm. level, at from 30*l.* to 150*l.* per fm. in value, but this piece of ground is being rapidly wrought and brought to market. Much of the value of this mine depends upon the 46 fm. level, which is being extended under the run of orey ground, and which is reported lately to be worth 20*l.* per fm. This company is bounded on the east by Wheal Hender, which was worked twice under the name of Copper Bottom, and abandoned. It is again set to work, and the shares from the sale of a few tons of ore rose in the adit level have advanced, 5s. 6d. paid, to 5*l.* A very rich deposit of ore was discovered here about 20 years ago, and we remember the shares commanding 500*l.* each in the market; but the ore did not hold down in depth. The Rosewarne United may, however, prove different in result—we hope and trust that it will.

CLOWANCE MINES, consisting of 256 shares, and selling for 75*l.* to 77*l.* 10s. per share, is situate in the parish of Gwinear, and adjoins the Rosewarne United; it is likely to become a mine of vast importance, and in all probability two years will see it in the same position as its neighbour. Capt. Bryant is appointed the local manager, and a new steam pumping engine is purchased, at an expense of 1000*l.*, which will be forthwith erected. A meeting of the shareholders lately took place upon the mine, when the prospects were considered most encouraging—an unexpended balance of 2900*l.* remains in hand. The company's grant extends to Clowance Park-gate, and is traversed by four or five known lodes, two elvan courses, and the junction of the granite and killas takes place in the sett. Parties desirous of a secure and profitable investment will do well to purchase herein.

The following are the most important tin mines, excepting Great Wheal Vor, which we will notice hereafter, if the necessary authentic information be furnished to us in time:—

GREAT FORTUNE.—A 70-in. pumping engine, a 36 double stamping and winding engine, a 24 ft. wheel, 3½ ft. breast, driving 32 heads of stamps; a 20 feet wheel, lifting 8 heads of stamps. The engine-shaft is sinking under the 60 fm. level, by eight men and four boys, at 18*l.* per fm. The 60 is driven on the lode for 26 fms. east and 29 fms. west, throughout which the backs will work at 8s. 6d. in 1*l.*, the east end being worth 25*l.*, and the west 16*l.* per fathom. The 50 fm. level is extended for about the same distance as the 60 east, and is worth from 10*l.* to 12*l.* per fm.; it is also extended 90 fms. west, and is worth at present 35*l.* per fm., varying from 5 to 6 ft. wide; a considerable quantity of ground is still standing in the back of this level. The 40 is extended still further west, having passed through the elvan course, and is at present worth 8*l.* per fm.; the back of this level is being wrought by 13 men, at an average tribute of 7s. in 1*l.* The 50 has also passed through the elvan course, and, as mentioned above, is worth 35*l.* per fm.; a long run of tin ground may be confidently expected in this direction, towards the Great Vor cross-course, about 80 fms. distant. The 40 east has not been extended since the resumption of the present working of the mine: 126 men are employed underground, 54 on tutwork, and 72 on tribute, at an average of 7s. 6d. to 8s. in 1*l.* The north lode in the 30 is worth 25*l.* per fm., is 4½ ft. wide, driving at 5*l.* 5s. per fm., is opened for 22 fms. in length, can be wrought at a tribute of 7s. 6d. in 1*l.*, and is standing whole to the 20 fathom level. The returns are now within 100*l.* per month of the working cost, and with 3*l.* per share additional calls the company will pay dividends. Its position is due south of the Great Vor, and many practical miners resident throughout the district regard it as a very progressive and valuable property. The amount of tin discovered in the backs of the several levels is estimated at 20,000*l.* The shares are 1024 in number, upon which 19*l.* 13s. 9d. is paid; the present price (call of 30s. paid) is 12*l.* to 13*l.* These shares will pay well for investment.

EAST MARGARET is a tin mine, situate in Uny Lelant, in the same locality as Margaret, Kitty (Lelant), Reeth, and Reeth Consols Mines, and, as we upon several former occasions have prognosticated, it will turn out a profitable and dividend company: the tin sold for the last quarter amounted to the sum of 1674*l.* 7s. 11d., which left a profit of 394*l.* 17s. 3d. The company consists of 1024 shares only, and sell at 8*l.* to 10*l.*, 5*l.* 17s. 6d. paid. The lode varies materially in value; at places worth only 5*l.* and in others 30*l.* per fathom. It is under the management of Capt. Treweeke, of the St. Ives Consols, which has netted profits of 888*l.* per share, 80*l.* paid, and is likely to exist for many years to come, although no profits have been divided since February, 1854.

LELANT CONSOLS, divided into 256 shares, 90*l.* paid. Another instance of gross mismanagement and inattention to the interests of the mine by the local captain; in fact, although paid 2*l.* 2s. per month, he has neither been underground or assisted the resident captain with his advice for four months past. The majority of the shares has lately changed hands, and at the next general meeting of shareholders a 5*l.* call will be made, and the shares subdivided into 2560; this additional capital will resuscitate the property, and within 12 months it will become a dividend mine. We strongly recommend these shares to the notice of our friends. A very efficient field of machinery is already upon the mine, and, but for mismanagement, the shares would sell for 50*l.* prem., instead of 80*l.* discount.

GILMAR is a small sett, adjoining West Providence, and in other hands would be held valuable; but good management is as necessary as good position to secure a good mine, and establish confidence with the public. It consists of 1024 shares, and are heavy at 5*l.* to 6*l.*

LEEDS TOWN CONSOLS is a melancholy instance of mismanagement. Considerable money has been expended upon this adventure, and calls have been responded to by the shareholders with a promptness that deserved a better fate. We have sold all our interest this week, and we advise all our friends to do the same. We subjoin a report received yesterday from Capt. Delbridge, a most practical and intelligent miner, thoroughly acquainted with the district; notwithstanding a hundred chances of success exist within the company's grant, yet the operations hitherto have been unadvisedly limited to one tin lode:—"Having carefully inspected Leeds Town' Consols Mine, I beg to hand you the following report. In the 10 fathom level, east of the engine-shaft, I find most of the ground unwrought, and it appears to be poor and unprofitable; in the end the lode is small, with a little tin, but not to value. In the 20 fm. level, the lode from engine-shaft to the great cross-course is in whole ground, and is from 1 to 2 ft. wide. East of the cross-course to the present end the lode is from 1 to 5 ft. wide; stoping on tutwork for tin—low price work; indeed, the level is poor. In the deeper levels the lode does not present so good an appearance as in the upper levels. In this part of the mine I was disappointed, as I fully expected to see a better lode, and more tin. At the flat-rod shaft, in the 10, the lode is large, producing a little tin about the shaft; this shaft is sinking below the 10—lode from 3 to 4 ft. wide, unproductive towards the bottom. The reports of former days have been exaggerated, and, I am sorry to say, there is but little tin here now; I advise you to do the best you can in this matter. There is no stock of stuff on the stamps to value, and the leavings from about 3 tons of tin cannot be considered to be worth much. Time is required in this mine, with money, to make it profitable. Whether this lode will produce copper, lead, or tin, depth and extent alone can decide; present riches are out of the question."

In the Caradon district, WEST CARADON is not now looking so well as it did a few months back, nor has the dividends equalled expectations. SOUTH CARADON, on the contrary, is looking better, and the shares fully maintain their price—viz., 315*l.*; whilst the former has receded to 140*l.* 150*l.* The following mine is well spoken of by practical miners:—

EAST CARADON MINE adjoins the South Caradon, and possesses the same lodes. It is divided into 6144 shares, and the shareholders are chiefly men of property, and unconnected with mining share transactions, otherwise the price would be considerably in advance of 30s., at which it now stands. The lode will be intersected 20 fms. below the adit level in two or three months, and great results are anticipated. In the adit level, 20 fms. from surface, the lode was 6 ft. wide, 4 ft. of which was gossan of the finest description, the remaining 2 ft. prian, spar, mundic, and peach. A 40-in. steam pumping-engine is at work, and the shaft is sinking below the 40 fm. level. The lode is good in South Caradon, within 60 fms. of the boundary, and the prospects of East Caradon are most encouraging.

The Lead Mines of Cornwall and Devon have fallen off considerably during the past 12 months.

| | |
|---|---|
| Trehane has paid only | £ 2560 |
| South Tamar | 7200 |
| Wheal Wrey | 2457 |
| Trelawny | 1300 |
| Exmouth and Adams | 570=£14,087 |

The aggregate profits from all the lead mines we possess is only one-fourth the profits of Devon Great Consols, or two-fifths of either Buller or Basset, whilst other mines in the latter district, as they become developed, promise equal returns and profits.

MILL POOL is reported to be looking well, yet the shares sell at a heavy discount.—WEST PROVIDENCE is improved, yet the shares stand at 12*l.*—EAST BASSET has receded to 45*l.*, yet the property must be more valuable than when it sold for 60*l.* per share.—MARGARET, a tin mine adjoining Lelant Consols, stands at 70*l.* to 75*l.*—NORTH BUSY, with improved prospects, situate in one of the best of localities (call of 13s. 1d. paid) is selling at 6*l.* to 7*l.*—WEST ALFRED CONSOLS, presenting greater chances of success than ever, and standing immediately west of Great Alfred and Alfred Consols, is selling at a discount—viz., 18*l.* per share, 26*l.* 7s. 8d. paid. Capitalists will do well to direct attention to this adventure.—CARNYORTH, a tin mine, has paid a dividend during the year, yet the shares, 3*l.* paid, stand at 30s. only.—TRELUSBACK is as poor as ever.—CARVANNAL is considerably improved in prospects; present price 3*l.* 5s. to 3*l.* 10s., and ought to be firmly held.

In Devonshire, the DEVON GREAT CONSOLS maintains its position. The price of shares for the past 12 months has not much fluctuated; it is now 360*l.* to 370*l.* This company has paid in dividends during the past 12 months 56,320*l.*, or 55*l.* per share. It has paid since the year 1844 the enormous sum of 461,824*l.*, and the capital subscribed was only 1024*l.*: it consists of 1024 shares. The BEDFORD UNITED has paid 1*l.* 6s. per share during the 12 months ending Aug. 30, and is marketable at 11*l.* 10s. to 12*l.* per share. This mine is represented to be discovering more ore than is being taken away and sold. With the exception of Exmouth and Adams, a lead mine, the Devon Great Consols and Bedford United are the only two dividend companies in Devonshire for the year ending Aug. 31. Two very promising mines have been discovered, however, holding out unusual prospects of success—viz., Sortridge Consols and North Robert. Sortridge Consols is thus represented—the 40 east as worth 5 tons per fm.; the 40 west, 5 tons per fm.; the stopes in back of the 30, 12 tons per fm., ditto, 10 tons per fm.; the winze under the 30, 7 tons per fm.; the tribute pitch in back of same level 5 tons per fm.; and the branch in the 20, 4 tons per fm. The monthly samplings for the past two months has been about 130 tons. These seven points would appear to turn out 48 tons per fathom; and, as at least 8 fms. of ground must be broken for the men to obtain fair remuneration, what becomes of the ore?—*i. e.*, the difference betwixt the samplings, 130 tons, and 336 tons, the quantity promised in accordance with the published reports. The company consists of 12,000 shares, 6s. paid, and the price is 6*l.* 10s. to 7*l.*; more than the price of South Frances eight months ago, three times the price of a Condurrow, and six times the price of a North Crofty.

NORTH ROBERT is a promising mine, selling at 32*l.* 10s., consisting of 1024 shares, 12*l.* paid, two-thirds the current value of West Caradon, and more than the price of East Basset, West Frances, and Clijah and Wentworth together.

The profits divided by Cornish and Devon Mines for the years 1846 to Sept. 1855, are as follows:—1846, 159,838*l.*; 1847, 155,381*l.*; 1848, 129,682*l.*; 1849, 185,743*l.*; 1850, 225,464*l.*; 1851, 217,486*l.*; 1852, 255,563*l.*; 1853, 325,338*l.*; 1854, 312,899*l.*; Aug. 31, 1854, to Aug. 31, 1855, 282,644*l.*, averaging for the 10 years (say) 225,000*l.*

From the above statistics, it appears that the profits for the year ending August 31, 1855, exceeded the average of the 10 past years by 57,000*l.*, and is minus that of the year 1854 by 30,255*l.*, which is accounted for as follows:—A deficiency in Alfred Consols of 8192*l.*; in Buller, of 17,920*l.*; Great Work, 1190*l.*; West Caradon, 1792*l.*; Condurrow, 1536*l.*; Botallack, 6100*l.*; Trelawny, 2340*l.*; Carn Brea, 2000*l.*; Exmouth and Adams, 2019*l.*; Trumpet Consols, 1000*l.*; West Providence, 1536*l.*; Margaret, 1686*l.*; whilst, on the contrary, we have Great Vor, Carnyorth, Great South Tolgus, Rosewarne United, and Great Crinnis, in the Dividend List for the first time; and although the policy of declaring dividends in Great South Tolgus and Great Crinnis is open to question, it is to be hoped that they will long maintain the position.

R. TREDINNICK,
Mining Share Dealer, Inspector and Manager of Mines,
Broker and General Commission Agent, &c.

4, *Austinfriars, London; Camborne, Cornwall.—London, Sept.* 7, 1855.

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BRASS appears to have been made in Germany for centuries before the manufacture was introduced into England. This is stated to have been done by a German, who worked at Esher, in Surrey, in the year 1649. The analysis of a few pieces of bronze, of undoubted antiquity—namely, a helmet with an inscription (found at Delphi, and now in the British Museum), some nails from the treasury of Atreus, at Mycenæ, an ancient Corinthian coin, and a portion of a breast-plate, or cuirass, of exquisite workmanship (also in the British Museum), affords about 87 to 88 parts copper to about 12 to 13 tin, per cent. The experiments of Klaproth and others give nearly the same results as to ingredients; the quantities sometimes slightly differ. Lead is contained in some specimens, as has been shown. Zinc, and the nature of it, as heretofore observed, was not known to the ancients. In an antique sword, found many years ago, in France, the proportions in 100 parts were, 87·47 copper, 12·53 tin, with a small portion of lead, not worth noticing.

BELL METAL is a compound of 80 parts copper to 20 parts of tin. The Indian gong, so much celebrated for the richness of its tones, contains copper and tin, in the above proportions. The proportion of tin in bell metal varies, however, from one-third to one-fifth of the weight of copper, according to the sound required, the size of the bell, and the impulse to be given. M. de Arcet has discovered that bell metal formed in the proportion of 78 parts copper, united with 22 of tin, is indeed nearly as brittle as glass, when cast in a thin plate or gong. Yet if it be heated to a cherry-red, and plunged into cold water, being held between two plates of iron, that the plate may not bend, it becomes malleable. Thus he manufactures gong, cymbals, and tantums out of this compound.

MOSAIC GOLD (OR MOLU) may be thus made: take copper and zinc, equal parts; mix them together at the lowest possible temperature at which copper will fuse, and stir until a perfect mixture of the metals is effected. Then add gradually small portions of zinc at a time, until the alloy acquires a proper colour, which is perfectly white while in the melted state. It should then at once be cast into figured moulds. This alloy should contain from 52 to 55 per cent. of zinc.

## MINING STATISTICS.

ZINC.—Since the extensive operations of the Vieille Montagne Company the manufacture of zinc from the English ores, calamine and sulphuret of zinc (black jack), has not been extensive. More attention is, however, now being paid to its production, and several mines are producing and selling considerable quantities of zinc ores. The following (during 1854), amongst others:—

| Mines. | | Black Jack. | | Calamine. | |
|---|---|---|---|---|---|
| Nant-y-Creian | Tons | 43 | 9 | ..... | — |
| Great Wheal Baddern | ..... | 57 | 17 | ..... | — |
| Lisburne | ..... | 200 | 0 | ..... | — |
| Greenwich Hospital Mines | ..... | 800 | 0 | ..... | 159 0 |
| Foxpath | ..... | 20 | 0 | ..... | — |
| Cefn Brwyno | ..... | 21 | 0 | ..... | — |
| Cae Ginon | ..... | 33 | 1 | ..... | — |
| Wheal Carpenter | ..... | 80 | 0 | ..... | — |
| Silver Brook | ..... | 43 | 3 | ..... | — |
| Minera Mines | ..... | 541 | 0 | ..... | — |
| Pencorse Consols | ..... | 500 | 0 | ..... | — |
| Laxey Mines | ..... | 1435 | 4 | ..... | — |
| Alston Moor Mines | ..... | 756 | 9 | ..... | 121 13 |
| Total | ..... | 4581 | 3 | ..... | 280 11 |

From an estimate carefully made of the products of other districts, and a valuation of the zinc ores of the different mines, it would appear that the value of the zinc smelted in England in 1854 was about 16,500*l.*

| | | |
|---|---|---|
| IMPORTS—Zinc or spelter | ..... | 19,583 tons. |
| ,, Oxide of zinc | ..... | 336 ,, |
| EXPORTS—Zinc or spelter | ..... | 3,030 ,, |

MUNDIC—IRON PYRITES.—The comparative cheapness of sulphur has greatly reduced the demand for the sulphur ores of the mines of the United Kingdom. Some is, however, still employed at St. Helen's, Newcastle, and at other places in chemical works, for the manufacture of sulphuric acid, &c. Ballymurtagh Mine, in county Wicklow, sold 34,000 tons. The quantity produced in Arklow is estimated at 90,000 tons. The only English mine from which a return of the pyrites sold has been made is Great Wheal Baddern, 128 tons. Cumberland and Westmoreland have sold to the chemical works on the Tyne 800 chaldrons of 3 tons each, or 2400 tons, and from the "Brasses" of the Durham and Northumberland coal fields a similar quantity has been obtained. In connection with this ore, and the economy of manufacture, the following facts are of interest:—The pyrites ash, that is the remains of the ore, the sulphur being separated, contains 1¼ per cent. of copper, and a trace of silver and gold. The copper is separated as sulphate of copper, and the silver as chloride of silver. This is, of course, brought into the condition of silver cake, and being sent to the metropolis, instead of fetching merely the price of silver, about 5s. the oz., it is bought after assay, the prices varying from 6s. to 10s. the oz., the additional value being due to the gold it contains.

ARSENIC.—The total quantity produced has not been ascertained. The undermentioned mines are the only ones from which returns have been made:—

| Mines. | | Quantity. | | | Value. | |
|---|---|---|---|---|---|---|
| Dolcoath | Tons | 132 | 5 | 0 19 | £243 | 17 6 |
| Great Wheal Baddern | ..... | 2 | 12 | 2 0 | ..... | — |
| Wheal Unity Consols | ..... | 103 | 11 | 0 0 | ..... | — |
| Carn Brea | ,, | 145 | 8 | 2 0 | 254 | 6 8 |
| East Pool | ..... | 93 | 1 | 0 0 | 188 | 1 0 |

BARYTES.—Of this mineral the following quantities have been sold:—

| | | |
|---|---|---|
| Isle of Arran | Tons | 600 19 |
| Derrenala Mine | ..... | 2500 0 |
| County Cork | ..... | 80 0 |
| Alston Moor | ..... | 121 18 |

NICKEL AND COBALT.—Of these ores the St. Austell Consols has sold 75 tons. The production from the Duke of Argyll's property in Scotland has not been ascertained.

UMBER, ROTTEN STONE, AND OCHRE.—

The Isle of Man Iron Company sold ..... 163 t. 19 c. 3 q. 26 lbs.

GENERAL SUMMARY of the MINERAL PRODUCE of the UNITED KINGDOM in 1854, valued at the current prices of the year:—

| | | | | |
|---|---|---|---|---|
| Tin | Tons | 5,763 | £ | 690,000 |
| Copper | ,, | 13,042 | | 1,229,807 |
| Lead | ,, | 64,005 | | 1,472,115 |
| Silver | Ozs. | 700,000 | | 192,500 |
| Iron (pig) | Tons | 3,069,838 | | 9,500,000 |
| Coal (at pits) | ,, | 61,661,401 | | 14,975,000 |
| Zinc | ..... | — | | 16,500 |
| Arsenic, sulphur ores, and sundry minerals | | — | | 500,000 |
| Total | ..... | | | £28,575,922 |

COATING METALS.—Mr. F. S. Thomas, of Fulham, and W. E. Tilley, of Kirby-street, have patented an improved process for plating or coating lead, iron, or other metals with tin, nickel, or alumina. The first part of this invention consists in a mode of preparing a solution of the metal with which the articles are to be coated or plated; for which purpose they proceed as follows:—For tin, metallic tin is dissolved by nitro-muriatic acid, and then precipitated by an alkali or alkaline salt, preferably by the ferro-cyanide of potassium; sulphuric acid or muriatic acid is then mixed with the precipitated oxide of tin, and water is added thereto. The mixture is boiled in an iron vessel, with a small portion of ferro-cyanide of potassium, and the liquor being filtered, the solution is completed. Another mode of forming a solution of tin is as follows:—The precipitated oxide of tin having been obtained as above described, ferro-cyanide of potassium is added to the oxide and boiled; the solution is then set aside to cool, and filtered; and a stream of sulphuric acid gas is subsequently passed through the solution. For nickel, this metal is dissolved by nitro-muriatic acid, and the oxide is precipitated by ferro-cyanide of potassium; the oxide is then washed, and cyanide of potassium, dissolved in distilled water, is added thereto. The mixture is then boiled, and when cool, it is filtered, which completes the solution of nickel. For alumina, alum is dissolved in water, and ammonia is added until it ceases to precipitate any more; the alumina is then washed and filtered, and distilled water is then added, and the mixture is boiled with cyanide of potassium. When cold, it is filtered, and the solution of alumina is ready. Having thus obtained either of the foregoing solutions, the patentees suspend the articles to be covered or plated, by copper or brass rods, in a bath of the required solution, and attach them to the zinc pole of a battery, to the positive pole of which is attached, in the case of a tin bath, a piece of platinum or a pole of tin. In the case of a nickel bath, a bag containing oxide of nickel or a pole of nickel; and in the case of a bath of alumina, a bag of alumina, or a pole of aluminium, or a piece of platinum. The patentees claim, firstly, the modes of forming the solution of tin, nickel, and alumina, hereinbefore described. Secondly, the plating upon other metals from solutions of tin and nickel, prepared as hereinbefore described, by means of a galvanic battery, to which is attached the oxides or poles of the same metals, or a pole of platinum, as before described. Thirdly, the plating other metals with alumina, or with aluminium, by means of a solution of alumina in connection with a galvanic battery.

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CANADIAN RAILWAYS.—The position of railways in Canada is at present exciting much interest, as whatever traffic may be obtained for them at the outset of their career, it must increase in exact proportion to the progress of the country. The Great Western of Canada now earns 34*l.* per mile per week, which may be considered to represent the wants of the present population; but that population is increasing at a rate hitherto unheard of, and will create a corresponding and continued increase in the traffic of every railroad in the province. French railroads have paid well, principally from the great quantities of goods, which find a manifest advantage in that mode of transit over the ordinary roads and canals (a maritime competition being, of course, out of the question); and in almost all French traffic returns it will be seen that the receipts from merchandise exceed those from the passengers. Transhipment is hilarity may be looked for on the Grand Trunk (Canadian) line of road. Transhipment will be avoided there, as elsewhere, and the produce of the West once on the cars will not be disturbed until it reaches the shipping port either at Portland or Quebec. Under these circumstances, it is only a question of time, and the sooner the works can be completed the sooner the 34*l.* per mile per week will be received. It has been remoured that some arrangement for the speedy construction of the Victoria Bridge has been thought of, by which the company would be relieved of the cost of making it, private parties being willing to advance the necessary funds. The advantage to the shareholders would in this case be the immediate resumption of the bridge works, without outlay on their part, and its construction in time for the opening of the entire line, which would thus be without a break from one end to the other. It is thought that the Canadian Government would do the wisest act within their power to guarantee for 15 years an interest on this "national provincial" work.

*** TAPPING'S PRIZE ESSAY ON THE COST-BOOK SYSTEM, enlarged and augmented, with Notes and an Appendix, can be had at the MINING JOURNAL office, 26, Fleet-street,—Price 5s.

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